ACS 600 **Hardware Manual Supplement**

ACS 601/604/607 AC Drives US Supplement

ACS 601/604/607 US Supplement

Hardware Manual Supplement

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Safety Instructions

Overview

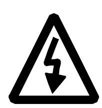
This chapter states the safety instructions which must be followed when installing, operating and servicing the ACx 600. If neglected, physical injury and death may follow, or damage may occur to the AC drive, the motor and driven equipment. The material in this chapter must be studied before attempting any work on, or with, the unit.

Warnings and Notes

This manual distinguishes two sorts of safety instructions. Warnings are used to inform of conditions which can, if proper steps are not taken, lead to a serious fault condition, physical injury or death. Notes are used when the reader is required to pay special attention or when there is additional information available on the subject. Notes are less crucial than Warnings, but should not be disregarded.

Warnings

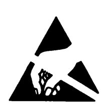
Warnings are provided in the instruction manuals and on labels attached to the AC drive. Readers are informed of situations that can result in serious physical injury and/or serious damage to equipment with the following symbols:



Dangerous Voltage Warning: warns of situations in which a high voltage can cause physical injury and/or damage equipment. The text next to this symbol describes ways to avoid the danger.



General Warning: warns of situations which can cause physical injury and/or damage equipment by means other than electrical. The text next to this symbol describes ways to avoid the danger.



Electrostatic Discharge Warning: warns of situations in which an electrostatic discharge can damage equipment. The text next to this symbol describes ways to avoid the danger.

Notes

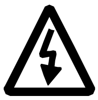
Notes are provided in the instruction manuals to notify readers of the need for special attention or additional information available on the subject with the following symbols:

CAUTION! — **Caution** aims to draw special attention to a particular issue.

Note: — **Note** gives additional information or points out more information available on the subject.

Installation and Maintenance Safety

These safety instructions are intended for all work on the ACx 600. In addition to the instructions given below, there are more safety instructions on the first pages of the appropriate hardware manual.



WARNING! All electrical installation and maintenance work on the ACx 600 should be carried out by qualified electricians.

The ACx 600 and adjoining equipment must be properly grounded.

Do not attempt any work on a powered ACx 600. After switching off the power, always allow the intermediate circuit capacitors 5 minutes to discharge before working on the drive, the motor or the motor cable. It is good practice to check (with a voltage indicating instrument) that the drive is in fact discharged before beginning work.

The ACx 600 motor cable terminals are at a dangerously high voltage when power is applied, regardless of motor operation.

The brake control terminals (UDC+, UDC-, R+ and R- terminals) carry a dangerous DC voltage (over 500V).

There can be dangerous voltages inside the ACx 600 from external control circuits when the ACx 600 input power is shut off. Exercise appropriate care when working with the unit. Neglecting these instructions can cause physical injury and death.



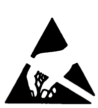
WARNING! The ACx 600 introduces electric motors, drive train mechanisms and driven machines to an extended operating range. The ACx 600 can be adjusted to operate the motor at speeds above and below the speed provided by connecting the motor directly to the power line. Before adjusting the drive and putting it into service, make sure that the motor and all driven equipment is suitable for operation throughout the speed range provided by the AC drive.



WARNING! If an external source for start command is selected and it is ON, the ACx 600 will start immediately after fault reset unless the drive is configured for 3-wire Start/Stop.



WARNING! When the control location is not set to Local (L not shown in the status line of the display), the Stop key on the Control Panel will not stop the drive. To stop the drive using the Control Panel you must press the LOC/REM key and then the Stop key.



WARNING! The printed circuit boards contain integrated circuits that are extremely sensitive to electrostatic discharge. Exercise appropriate care when working on the unit to avoid permanent damage to the circuits. Do not touch the boards unnecessarily.

WARNING! There are several automatic reset functions in the ACx 600. If selected, they reset the unit and resume operation after a fault. These functions should not be selected if other equipment is not compatible with this kind of operation, or dangerous situations can be caused by such action.

Supply Connections

The ACx 601 does not include a disconnecting means. An input power disconnecting means **must** be installed between the AC power source and the ACx 601. The disconnecting means must conform to the applicable safety regulations. The disconnecting means must be locked in the open position during installation and maintenance work.

The motor must not be controlled with the supply disconnecting means; instead, the and keys of the Control Panel or commands via the I/O board of the ACx 600 should be used. The maximum number of charging cycles of the d.c. capacitors of ACx 600 (i.e. power-ups by applying power) is five in ten minutes.

ACx 6x7 units include an on-load isolating fused disconnect with a through the door handle. This switch does not switch off power from the EMC Line filter of the ACx 607-0490-3/5/6, -0610-3/5/6 and -0760-5/6 units. For ACx6x7-0490-3/5/6, -0610-3/5/6, and -0760-5/6 units with EMC filters and for the ACx 604 module, a supply disconnecting device must be installed in the supply, by which the electrical parts of the unit can be separated from the power network during installation and maintenance work. The supply disconnecting device must be locked to the open position during installation and maintenance work.

WARNING! Never connect the line power to the ACx 600 output terminals U_2, V_2, or W_2. If frequent bypassing is required, mechanically interlocked switches or contactors should be employed. Line voltage applied to the output may result in permanent damage to the unit.

Operation outside the nominal input line voltage range should not be attempted, as overvoltages can result in permanent damage to the ACx 600.

If an ACx 601 with the integrated EMC filter (code 0 in the type code for EMC Filters) is connected to an ungrounded power system or high resistance grounded power system (over 30 Ohms), the power line will be connected to ground potential through the EMC filter capacitors of the ACx 601. This may cause danger or damage the unit. Disconnect the EMC filter capacitors before connecting the ACx 601 to an ungrounded power system. For detailed instructions on how to do this, please contact your local ABB distributor.

It is not allowed to install an ACx6x4/6x7 with EMC filter options to

ungrounded systems, or high resistance grounded power systems (over 30 ohms). The main power will be connected to earth potential through the EMC filter of the ACx 600 which may cause danger or damage to the unit. Disconnect the EMC filter capacitors before connecting the ACx 600 to ungrounded systems. For detailed instructions on how to do this, please contact your local ABB distributor.

Ground Fault Protective Function

The ACx 600 is equipped with an internal ground fault protective function to protect the unit against ground faults in the drive, the motor and the motor cable. This is not a personal safety or a fire protection feature. The ground fault protective function of the ACx 600 can be set to warning only by Parameter 30.17 for Standard Application Program and Parameter 30.11 for Crane Application Program. The internal ground (earth) fault protection is not in use in the 12-pulse supplied units. For ACX 62x units, refer to the ACx 607 hardware manual subsection labelled “Special ACx 6x7 units from 315 to 630 kW”.

The EMC filter of the ACx 600 includes capacitors connected between the power circuit and the chassis. These capacitors increase the ground leakage current from the AC line through the ground (PE) connection and may cause some ground fault current circuit breakers to trip.

Emergency Stop Devices

The person responsible for the overall design and operation of the driven process must make sure that the installation includes emergency stop devices and any other safety equipment that may be needed. Pressing the STOP key on the Control Panel of ACx 600 does not generate an emergency stop of the motor or separate the drive from dangerous potential. A Line Contactor with provisions for a remote power cut-off switch is available as a factory installed option for the ACx 607. Cutting off power to the drive allows the motor to coast to a stop.

Ground Connections

The ACx 600 and adjoining equipment must be properly grounded.

The ACx 600 and the motor must be grounded at the installation site to ensure personnel safety in all circumstances and in addition to reduce electromagnetic emission and pick-up. Make sure that grounding conductors are adequately sized as required by safety regulations.

In CE compliant installations and in other installations where EMC emissions must be minimized, 360 degree high frequency grounding of cable entries is done in order to suppress electromagnetic disturbances. In addition, power cable shields must be connected to the ground (PE) in order to meet safety regulations. Power cable shields are suitable for use as equipment grounding conductors only when the shield conductors are adequately sized as required by safety regulations.

The ACx 600 ground terminals should not be connected in series in case of a multiple installation. Incorrect grounding can cause physical injury, death or equipment malfunction and increase electromagnetic interference.

Motor Connections

WARNING! Operation is not allowed if the motor nominal voltage is less than one half of the ACx 600 nominal input voltage, or the motor nominal current is less than 1/6 of the ACx 600 nominal output current.

WARNING! Do not make any voltage tolerance or insulation resistance test (Hi-Pot or Megger) on any part of the ACx 600. Disconnect motor wires before making any tests of the motor or the cables between the drive and motor.

Conduit

Metallic conduit must be used for motor wiring unless armored cable or power shield cable is used. Where conduits must be coupled together, the joint must be bridged with a ground conductor bonded to the conduit on each side of the joint. The conduits must also be bonded to the drive enclosure. Use separate conduits for input power, motor, brake resistors, and control wiring. Do not run motor wiring from more than one drive in the same conduit.

Armored Cable

If metallic conduit is not used, type MC continuous corrugated aluminum armor cable with symmetrical grounds or power shield cable must be used for the motor cables. If these cables are used, the motor cables can be run in the same cable tray as other 460V or 600V power wiring. Control and signal cables must not be run in the same tray as power cables.

Six conductor (3 phases and 3 ground) type MC continuous corrugated aluminum armor cable with symmetrical grounds is available from the following suppliers. Trade names are in parentheses.

Anixter Wire & Cable (Philsheath)

BICC General Corp (Philsheath)

Rockbestos Co. (Gardex)

Oaknite (CLX)

Power shielded cables are available from Belded, Olflex, and Pirelli.

Motor Insulation Requirements

As with all AC drives employing the most modern IGBT invertor technology, the output waveform of the ACx 600 consists of a series of rectangular voltage pulses. Regardless of the output frequency, the voltage of the pulses is approximately 1.35 times the input line voltage with a very short rise time.

The voltage of the pulses can be almost double at the motor terminals, depending on the length of cable between the drive and the motor. This in turn can cause additional stress to the motor insulation. The motor manufacturer should be consulted regarding the characteristics of the motor insulation system. Failure of the motor to fulfill the following requirements may shorten its life.

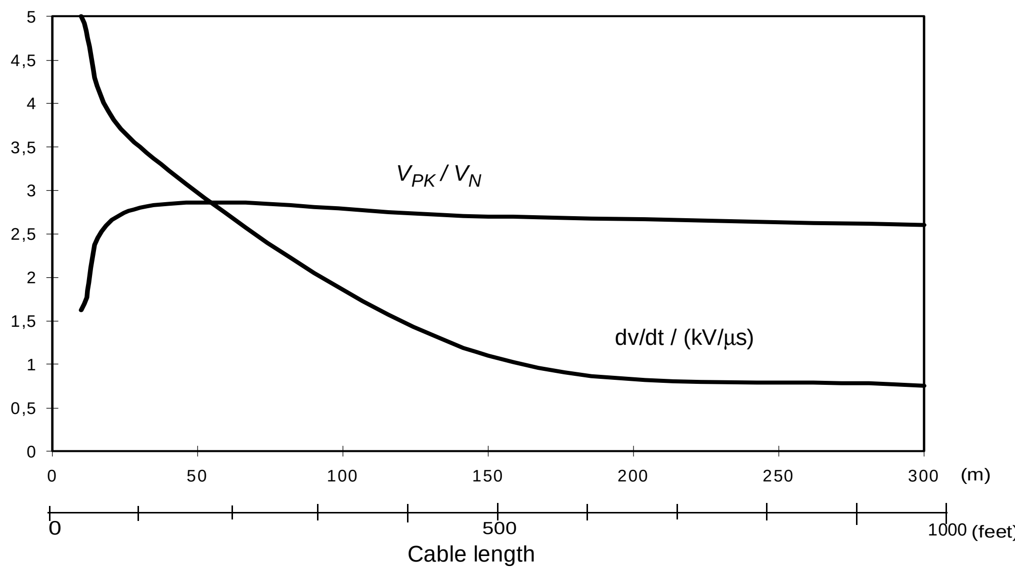
The following table lists the insulation requirements for motors used with ACx 600 AC drives.

Motor Type	Nominal AC Line Voltage	Motor Insulation Requirement
ABB Motors (manufactured from beginning of 1998)	V_N < 500 V	Standard insulation system
	525 V ≤ V_N ≤ 690 V	Standard insulation and dv/dt filter or special insulation system
Random-wound Motors	V_N ≤ 420 V	Motor insulation system must withstand V_{PK} = 1300 V.
	420 V < V_N ≤ 500 V	If motor insulation system withstands V_{PK} = 1600 V and 0.2 µs rise time, a dv/dt filter is not needed. With a dv/dt filter at the output of the ACx 600, motor insulation system must withstand V_{PK} = 1300 V.
	500 V < V_N ≤ 600 V	Motor insulation system must withstand V_{PK} = 1600 V. A dv/dt filter must be used at the output of the ACx 600.
	600 V < V_N ≤ 690 V	Motor insulation system must withstand V_{PK} = 1800 V. A dv/dt filter must be used at the output of the ACx 600.
Form-wound Motors	V_N ≤ 690 V	If motor insulation system withstands V_{PK} = 2000 V and rise time 0.3 µs, no dv/dt filter is needed.

Symbol	Definition
V_N	nominal power line voltage
V_{PK}	peak line to line voltage at motor terminals
Rise time: $\triangle t = 0.8 \cdot V_{PK}/(dv/dt)$	Rise time is line to line voltage change rate at motor terminals (the interval during which the voltage changes from 10% to 90% of the whole voltage range) V_{PK} and $\triangle t$ depend on cable length. Read the values of V_{PK} and dv/dt from the diagrams below.

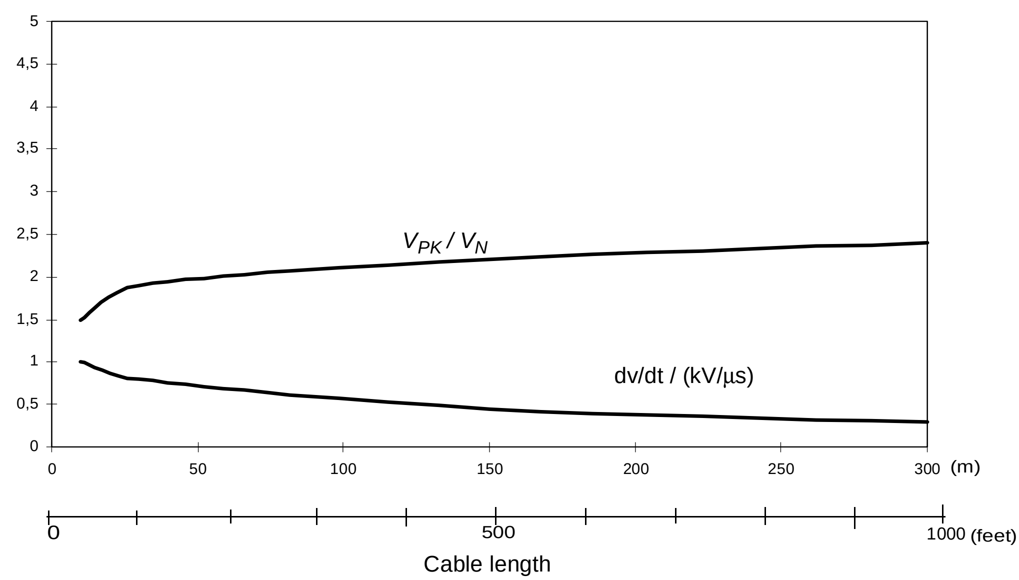
Without Filter

Below is a diagram of V_{PK} and *dv/dt* as a function of cable length when no dv/dt filter is used.



With dv/dt Filter

Below is a diagram of V_{PK} and *dv/dt* as a function of cable length with dv/dt filter at the output of the ACx 600.



Power Factor Correction Capacitors

Power factor correction capacitors and surge absorbers must not be connected between the drive and the motor. These devices are not designed to be used with AC drives, and will degrade motor control accuracy. They can cause permanent damage to the ACx 600 or themselves due to the rapid changes in the ACx 600 output voltage.

Power factor correction capacitors in parallel with the ACx 600 three phase input can be problematic. Contact factory if questions arise.

Output Contactors

If a contactor is used between the output of the ACx 600 and the motor with DTC control mode selected, the output voltage of the ACx 600 must be controlled to zero before the contactor is opened: ACx 600 units via parameter 21.3, choose COAST. If RAMP is selected, the output of the ACx 600 must be reduced to zero using Parameter 16.1 by giving zero V DC to the selected digital input. Otherwise the contactor will be damaged. In scalar control the contactor can be opened with ACx/ACC 600 running.

Varistors or RC networks (AC) or diodes (DC) should be used to protect against voltage transients generated by contactor coils. The protective components should be mounted as close as possible to the contactor coils. Protective components should not be installed at the NIOC board terminal block.

EMC

When used with inductive loads (relays, contactors, motors), the relay contacts of ACx 600 must be protected with varistors or RC networks (AC) or diodes (DC) against voltage transients. The protective components should not be installed at the NIOC board terminal block.

Installing control devices (contactors or relays) or control cables other than those of the ACx 600 inside the drive enclosure is not acceptable.

Note: If safety switches, contactors, connection boxes or similar equipment are installed between the drive and the motor, they should be installed in a metal enclosure in a way that the conduit or motor cable shielding runs consistently without breaks from the drive to the motor, so the emission level will be minimized.

Mechanical Installation

CAUTION! The ACx 601 weighs a considerable amount, and should not be handled by the front cover. The unit should only be placed on its back. Exercise appropriate care when maneuvering the unit to avoid damage and injury. Lifting the ACx 601 is much easier and safer with two people working together.

CAUTION! The ACx 6x7 should only be transported on the original pallet, or with a proper lifting device using the lifting lugs on top of the cabinet. The drive is not intended to be lifted by running lines under the unit. The ACx 607 center of gravity is quite high, and there is a risk of over turning the unit. The ACx 607 can be laid on it's back to fit though confined spaces. Exercise appropriate care when maneuvering the unit to avoid damage or injury.

CAUTION! Make sure that dust from drilling does not enter the ACx 600 when installing. Electrically conductive dust inside the unit may cause damage or lead to malfunction.

CAUTION! Do not fasten the ACx 600 by riveting or welding.

WARNING! The cooling air flows and space requirements must be fulfilled. Special attention must be paid to cooling if units are installed in confined spaces and user defined cabinets.

Chapter 1 – Introduction

Overview

This chapter describes the purpose and contents of this manual.

This manual is a supplement to the ACx 601/604/607 AC Drive Hardware Manuals. The information contained in this manual is:

- specific to 200 to 240 VAC product as well as 380-500 V product distinguished by digit 11 in the ACS 600 type code being designated as a 4. The information in the manual takes precedent over any contradictory data found in any other user manual.
- for installations within the United States that must be installed per the National Electric Code and local codes.

Intended Audience

The intended audience of this manual are people who are responsible for installing, starting and servicing the ACx 601 or ACx 604/607 AC drive. The audience is expected to:

- Have a basic knowledge of physical and electrical fundamentals, electrical wiring practices, electrical components and electrical schematic symbols.
- Have no prior experience of ABB products.
- Have no prior experience of AC drives.
- Have no prior experience of the ACx 600 product family.
- Have no prior experience or training of installing, commissioning, operating and servicing the ACx 600.

What this Manual Contains

Safety Instructions are placed on the first pages of this manual. The safety instructions describe the formats for various warnings and notations in use in this manual. The chapter also states the general safety instructions that are intended for all work on the ACx 600.

Chapter 1 - Introduction gives information on the related publications, product family, delivery check, and type code of the ACx 601 or ACx 604/607. Chapter 1 in this manual supersedes the entire Chapter 1 in the ACx 601 and ACx 604/607 AC Drive Hardware Manuals.

Appendix A - ACx 604/607 Technical Data lists the ACx 600 technical specifications. Appendix A in this manual supersedes the entire Appendix A in the ACx 601 and ACx 604/607 AC Drive Hardware Manuals. Refer only to the Appendix A in this manual and disregard the Appendix A in the Hardware Manuals.

Related Publications

In addition to this manual the ACx 601/604/607 AC drive user documentation includes the following publications:

- ACx 601 or ACx 604/607 Hardware Manual
- ACx 600 Firmware Manual
- ACx 600 Drive*Window* User's Manual (optional)
- Several Option Module Manuals
- ACx 600 Technical Catalog
- ACx 600 Converter Module Installation In User Defined Cabinet

Product Family

The ACx 600 product family of three phase AC drives includes

- the ACx 600 (for most applications)
- the ACC 600 (for crane drive applications)
- the ACx 600 MultiDrive (for multi drive applications)

The application programs are introduced in *Appendix – A*.

Study this manual carefully before installing, commissioning, operating or servicing the drive. We expect that you have a basic knowledge of physical and electrical fundamentals, electrical wiring practices, electrical components and electrical schematic symbols.

Delivery Check

Check that there are no signs of damage. Before attempting installation and operation, check the information on the drive nameplate to verify that the unit is the correct model.

Nameplate

Each ACx 600 has a nameplate for identification purposes. See Figure 1-1. The nameplate data includes a type code and a serial number which allow individual recognition of each unit.

Type Code

The ACx 600 Type Code contains information on the properties and configuration of the drive. The Type Code Chart explains the significance of each digit or character in the Type Code.

Frame Size

ACx 600 drives are manufactured in several different chassis sizes that are designated as Frame R2, R3, etc. Drives of several different ratings are manufactured in the same frame. The ACx 600 rating tables on page A-1 in Appendix A list the Frame Size used for each Type Code. The Frame Size is not marked on the nameplate.

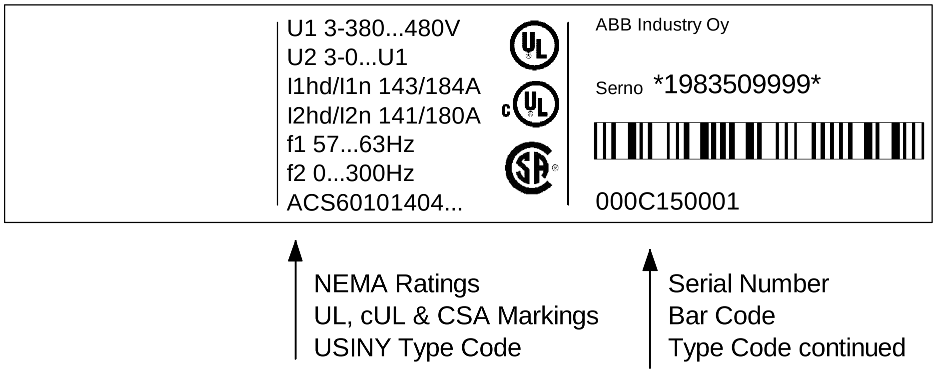


Figure 1-1. ACx 600 Nameplate

ACx 600 Type Code

The meaning of main selections of ACx 600 type code characters is given in the table below. Not all selections are available for all types. More information on selections is available in the ACx 600 price list.

Character no.	Meaning	Refer to
Example: ACx60701003000B1200901		
1	**Product Category** A = AC Drive	
2...3	**Product Type** CS = Standard, CC = Crane Drive	
4	**Product Family** 6 = ACx 600	
5	**Input Bridge** 0 = 6-pulse rectifier, 1 = Regenerative 4Q IGBT Bridge, 2 = 12-pulse rectifier, 7 = Regenerative 4Q thyristor bridge	
6	**Construction** 1 = Wall mounted, 4 = Module, 7 = Drives-MNS Cabinet	
7...10	**Power Rating (kVA)**	*Appendix A: Ratings*
11	**Voltage Rating** 2 = 240 VAC 3 = 380/400/415 VAC 4 = 380/400/415/440/460/480/500 VAC 5 = 380/400/415/440/460/480/500 VAC 6 = 525/550/575/600/660/690 VAC	
12...14	**Option 1, Option 2, Option 3**	
15	**Application Software** x = Languages and Application Macro Options	*Appendix A: Application Programs*
16	**Control Panel** 0 = None, 1 = CDP 312 Control Panel included, 4 = Customer I/O Terminal Block X2, 5 = Options 1 + 4	

Character no.	Meaning	Refer to
17	**Degree of Protection** 0 = IP 00 (chassis), A = IP 21, 2 = IP 22, 5 = IP 54, 6 = IP 00 with Coated Boards, 7 = IP 22 with Coated Boards, 8 = IP 42 with Coated Boards 9 = IP 54 with Coated Boards B = IP 21 with Coated Boards	*Appendix A: Enclosures*
18	**Line Input and Protection Options**	
19	**Starter for Auxiliary Motor Fan**	
20	**Filters** 0 = CE with EMC Filters (not for 690V or 12-pulse rectifier) 230V Not CE 3 = CE with output dv/dt Filters + EMC Filters (not for 690V) 5 = Output dv/dt Filters + no EMC Filters 8 = US Standard, US conduit: No CE, no EMC filters, 9 = CE Low Voltage and Machinery Directives; No EMC (ACx 607 only, secondary of all transformers 220 VAC) (Not valid for XTs with “4” top/top “6” top/top w/brake chopper.) A = 8 + dv/dt Filter	*Appendix A: CE marking*
21	**Braking Chopper and Cabling Direction** 0 = No Brake Chopper - Bottom Entry / Bottom Exit 1 = Brake Chopper (Bottom Entry / Bottom Exit) 3 = Input Power Top Entry / Output Power Bottom Exit - No brake chopper 4 = Input / Output Power Top Entry / Exit - No brake chopper (Not valid for XTs with dv/dt filters, EMC filters, or 12 pulse rectifier.) 5 = Option 1 and 3 6 = Option 1 and 4 (Not valid for XTs with dv/dt filters, EMC filters, or 12 pulse rectifier.) R = NDCU-XX	
22	**Other Options** 0 = None, 1 = Version 5.x Software, 2 = Version 5.x Harmonized (ACx 6x7 only), 3 = Version 6.x Software	

Inquiries

Any inquiries about the product should be addressed to the local distributor or ABB representative, quoting the type code and the serial number of the unit. If the local ABB representative cannot be contacted, inquiries should be directed to the address and phone numbers on the back cover of this manual.

Appendix A – ACS/ACC 600 Technical Data

Drive Output Ratings

Below are the Nema ratings for ACS/ACC 600 drives with nominal 240 and 460 volt 50 Hz and 60 Hz supplies. ACx = ACS/ACC. Symbols are described in the following the table.

ACx 600 Type Code	Normal Use					Heavy-duty Use							Frame Size
	Duty Cycle 1/10 min					Duty Cycle 1/10 min		Duty Cycle [1)] 2/15 s					
	I_{2N} 9/10min [A]	I_{2Nmax} 1/10min [A]	S_N [kVA]	P_N [kW]	P_N [HP]	I_{2hd} 9/10min [A]	I_{2hdmax} 1/10min [A]	I_{2hd} 13/15s [A]	I_{2hdmax} 2/15s [A]	S_{hd} [kVA]	P_{hd} [kW]	P_{hd} [HP]	
Three-phase supply voltage 200 - 240 V													
ACx 601-0003-2	7.8	8.6	3	1.1	1.5	5	7.5	5	10	2	0.8	1	R2
ACx 601-0005-2	11	12.1	5	1.5	2	7.8	11.7	7.8	15.6	3	1.1	1.5	
ACx 601-0006-2	15	16.5	6	2.2	3	11	17	11	22	5	1.5	2	
ACx 601-0009-2	18	19.8	9	3.7	5	15	23	15	30	6	2.2	3	
ACx 601-0011-2	25	28	11	5.5	7.5	18	27	18	36	9	3.7	5	R3
ACx 601-0016-2	32	35	16	7.5	10	25	38	25	50	11	5.5	7.5	
ACx 601-0020-2	48	53	20	11	15	32	48	32	64	16	7.5	10	R4
ACx 601-0025-2	60	66	25	15	20	48	72	48	96	20	11	15	
ACx 601-0030-2	75	83	30	18.5	25	60	90	60	120	25	15	20	R5
ACx 601-0040-2	88	97	40	22	30	75	113	75	150	30	18.5	25	
ACx 601-0050-2	114	125	50	30	40	88	132	88	176	40	22	30	
ACx 601-0060-2	143	157	60	37	50	114	171	114	228	50	30	40	R6
ACx 601-0070-2	178	187	70	45	60	143	215	143	286	60	37	50	
ACx 601-0080-2	211	232	80	55	75	178	255	178	340	70	45	60	R7
ACx 601-0100-2	248	300	100	75	100	192	317	211	422	80	55	75	
ACx 604/7-0120-2	316	348	120	90	125	273	390	273	520	100	75	100	R8
ACx 604/7-0140-2	395	435	150	110	150	316	474	316	632	120	90	125	R9
ACx 604/7-0170-2	480	528	200	150	200	395	593	395	790	150	110	150	
Three-phase supply voltage 380 - 500 V													
ACx 601-0006-4	7.6	8.4	6	4	5	6.2	9.3	6.2	12.4	5	3	3	R2
ACx 601-0009-4	11	12	7.5	5.5	7.5	7.6	11	7.6	15.2	6	4	5	R2
ACx 601-0011-4	15	17	10	7.5	10	11	17	11	22	9	5.5	7.5	R2
ACx 601-0016-4	21	23	16	11	15	15	23	15	30	11	7.5	10	R3
ACx 601-0020-4	27	30	20	15	20	19	27	19	36	16	11	10	R3
ACx 601-0025-4	34	37	25	18.5	25	24	36	24	48	20	15	15	R4
ACx 601-0030-4	41	45	30	22	30	31	47	31	62	25	18.5	20	R4
ACx 601-0040-4	52	57	40	30	40	41	62	41	82	30	22	30	R5
ACx 601-0050-4	65	72	50	37	50	47	71	47	94	40	30	30	R5
ACx 601-0060-4	77	85	60	45	60	58	87	58	116	50	37	40	R5
ACx 601-0070-4	96	106	70	55	75	68	98	68	130	60	45	50	R6
ACx 601-0100-4	124	136	100	75	100	86	126	86	168	70	55	60	R6
ACx 601-0120-4	156	172	120	90	125	113	168	113	224	100	75	75	R7
ACx 601-0140-4	180	198	140	110	150	141	203	141	270	120	90	100	R7
ACx 604/7-0120-4	156	172	120	90	125	113	168	113	224	100	75	75	R7
ACx 604/7-0140-4	180	198	140	110	150	141	203	141	270	120	90	100	R7
ACx 604/7-0170-4	216	238	170	132	150	172	246	172	328	140	110	125	R8
ACx 604/7-0210-4	260	286	210	160	200	200	300	200	400	170	132	150	R8
ACx 604/7-0260-4	316	348	260	200	250	240	360	240	480	210	160	200	R8
ACx 604/7-0320-4	414	455	320	250	300/ 350	300	450	300	600	260	200	250	R9
ACx 604/7-0400-4	480	528	400	315	400	365	548	365	730	320	250	300	R9
ACx 604/7-0490-5	570	627	490	400	500	456	684	456	912	400	315	400	2xR8
ACx 604/7-0610-5	694	764	610	500	600	570	855	570	1140	490	400	500	2xR9
ACx 604/7-0760-5	874	961	760	630	700	694	1041	694	1388	610	500	600	2xR9

Current ratings are for operation up to 1000m (3300 ft) altitude and 40°C(104°F) ambient temperature (35°C/95°F for models ACx 601-0025-2, ACx 601-0050-2 and ACx 601-0070-2 in IP54 enclosures). For high temperature and altitude derating, see pages A-3 to A-7.

The current ratings are the same regardless of the supply voltage within one voltage range. The rated current of the ACx 60x must be higher than or equal to the rated motor current to achieve the rated motor power given in the table.

***Note 1:** The maximum allowed motor shaft power is limited to 1.5 · P_{hd}. If the limit is exceeded, the motor torque and the I_{hdmax} 2 s current is automatically restricted. The function protects the input bridge of the ACx 600 against overload.*

***Note 2:** The load capacity (current and power) decreases if the installation site altitude exceeds 1000 meters (3300 ft.), or if the ambient temperature exceeds 40 °C.*

Usually dv/dt filters are not needed at the output of 240 V units.

Symbols Used in Rating Table

Normal use (10% overload capacity):

I_{2N}	rated RMS output current
I_{2Nmax}	short term rms overload current (allowed for one minute every 10 minutes).
S_N	rated apparent output power
P_N	typical motor power. The power ratings in kW apply to most IEC 34 motors. The power ratings in HP apply to most four pole NEMA rated motors.

Heavy-duty use (50% or 100% overload capacity):

I_{2hd}	rated RMS output current
I_{2hdmax}	rms overload current (allowed for one minute every 10 minutes or 2 seconds every 15 seconds) Maximum current depends on parameter setting, refer to Firmware Manual.
S_{hd}	rated apparent output power
P_{hd}	typical motor power. The power ratings in kW apply to most IEC 34 motors. The power ratings in HP apply to most four pole NEMA rated motors.

Output Current Derating For High Ambient Temperature

When the ambient temperature of the air around the drive exceeds the rated temperature, the rated output current is decreased by some percentage of the normal current rating for every degree above the rated temperature. The output current is calculated by multiplying the I_{2N} current given in the rating table by a derating factor determined from the derating curves. The derating factor is determined by the ambient temperature, the type of enclosure and the duty classification.

ACx 601 Drives

Note: Curve numbers refer to the Derate Curves and the Derate Table which immediately follow the derating instructions. Maximum temperature in all cases should not exceed 50 °C.

For IP 21/22 enclosures with Normal Use:

Below +40 °C: Apply curve 1 (no derate) to I_{2N} for all drives except model ACx 601-0100-2 which requires application of curve 2.

Above +40 °C: Decrease I_{2N} by 3.5% for every 1 °C above 40 °C. Reduction should begin from the value applicable at 40 °C (i.e., 92% of I_{2N} for ACx 601-0100-2, 100% for all other drives).

For IP 21/22 enclosures with Heavy Duty Use:

Below +40 °C: Use the I_{2HD} current rating given in the Drive Output Ratings table. No derating is required.

Above +40 °C: Calculate a tentative derated current per the IP 21/22 Normal Use, Above +40 °C instructions above. Compare this calculated value with the I_{2HD} current given in the Drive Output Ratings table. The current rating equals the smaller of I_{2HD} from the Drive Output Ratings table or the calculated derated current.

For IP 54 enclosures with Normal Use:

Below +40 °C: Locate the pertinent drive type code in the Derate Table to determine the curve number to apply. Find the ambient temperature at the bottom of the Derate Curves. Follow this temperature up vertically to where it meets the applicable curve number. From the point of intersection read across horizontally to determine the appropriate percent derate. The current rating equals the I_{2N} current from the Drive Output Ratings table times the percent derate.

Above +40 °C: Calculate the I_{2N} current derate (if any) at 40 °C per the IP 54 Normal Use, Below +40 °C instructions immediately above. Starting from this current level decrease the current rating an additional 3.5% of I_{2N} for each 1 °C above 40 °C.

For IP 54 enclosures with Heavy Duty Use:

Below +40 °C: Use the I_{2HD} current rating given in the Drive Output Ratings table. No derating is required.

Above +40 °C: Calculate a tentative derated current per the IP 54 Normal Use, Above +40 °C instructions above. Compare this calculated value with the I_{2HD} current given in the Drive Output Ratings table. The current rating equals the smaller of I_{2HD} from the Drive Output Ratings table or the calculated derated current.

ACx 607 Drives Maximum temperature in all cases should not exceed 50 °C.

For IP 21/22 enclosures with Normal Use:

Below +40 °C: Use the I_{2N} current rating given in the Drive Output Ratings table. No derating is required.

Above +40 °C: Decrease I_{2N} by 1.5% for every 1 °C above 40 °C.

For IP 21/22 enclosures with Heavy Duty Use:

Below +40 °C: Use the I_{2HD} current rating given in the Drive Output Ratings table. No derating is required.

Above +40 °C: Use the I_{2HD} current rating given in the Drive Output Ratings table. No derating is required.

For IP 54 enclosures with Normal Use:

Below +40 °C: Use the I_{2N} current rating given in the Drive Output Ratings table. No derating is required.

Above +40 °C: Decrease I_{2N} by 1.5% for every 1 °C above 40 °C.

For IP 54 enclosures with Heavy Duty Use:

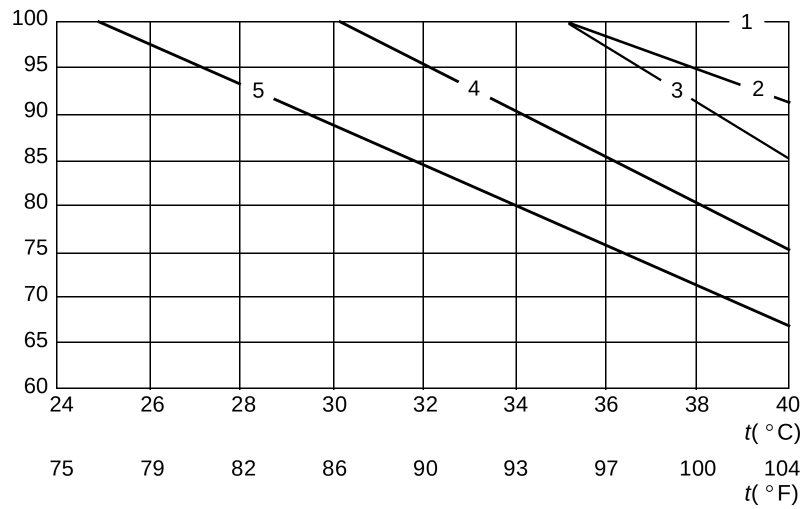
Below +40 °C: Use the I_{2HD} current rating given in the Drive Output Ratings table. No derating is required.

Above +40 °C: Use the I_{2HD} current rating given in the Drive

Output Ratings table. No derating is required.

Diagram Output current for ACS/ACC 601 with degree of protection IP 54 and with ambient temperature from 25 °C (77 °F) to 40 °C (104 °F) is presented in the diagram below. I_{2N} total rms output current for normal use.

Derate Curves



Derate Table

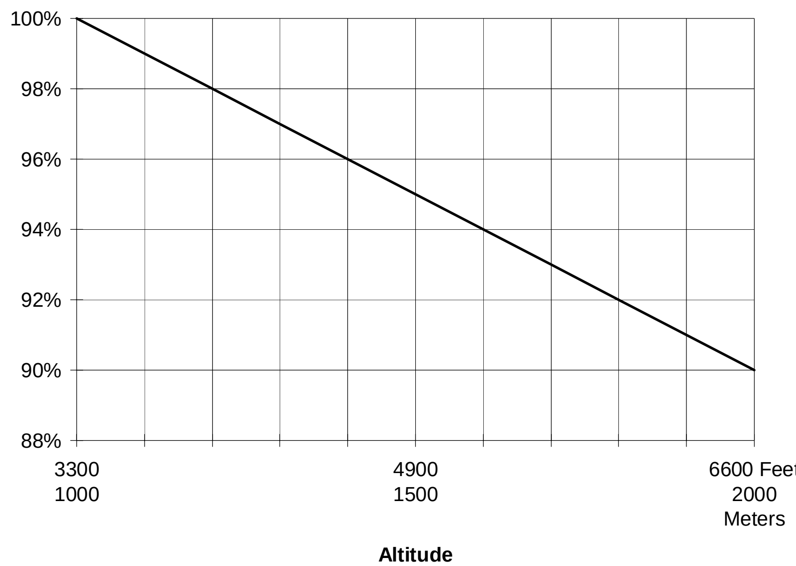
Curve 1 (100 % no derating)	Curve 2	Curve 3	Curve 4	Curve 5
ACx 601-0006-4	ACx 601-0009-4	ACx 601-0016-4	ACx 601-0011-4	ACx 601-0020-4
ACx 601-0025-4	ACx 601-0100-2	ACx 601-0050-4	ACx 601-0100-4	
ACx 601-0030-4	ACx 601-0025-2	ACx 601-0060-4		
ACx 601-0040-4	ACx 601-0050-2			
ACx 601-0070-4	ACx 601-0070-2			
ACx 601-0003-2				
ACx 601-0005-2				
ACx 601-0006-2				
ACx 601-0009-2				
ACx 601-0011-2				
ACx 601-0016-2				
ACx 601-0020-2				
ACx 601-0030-2				
ACx 601-0040-2				
ACx 601-0060-2				
ACx 601-0080-2				

Output Current Derating For High Altitude

When the altitude of the installation site exceeds 1000 m (3300 ft.) above sea level, the rated output current for **Normal Use** is decreased by 1% for every additional 100 m (300 ft.). If the installation site is higher than 2000 m (6600 ft.) above sea level, please contact your local ABB distributor or office for further information. **For Heavy Duty Use**, apply the I_{2HD} current given in the rating table up to 2000 m (6600 ft.). No derating is required.

The output current is calculated by multiplying the I_{2N} current given in the rating table by the derating factor determined from the derating curve.

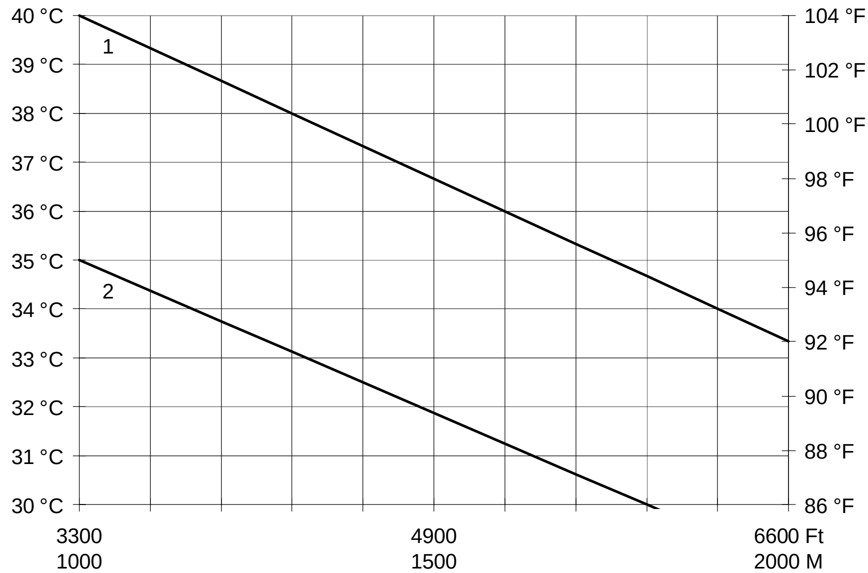
Output Current Derating Factors for High Altitude
(Percent of I_{2N})



Temperature Derating For High Altitude

When the altitude of the installation site exceeds 1000 m (3300 ft.) above sea level, the rated ambient temperature can be decreased as an alternative to decreasing the rated output current. Use curve 2 for models ACx 601-0025-2, ACx 601-0050-2 and ACx 601-0070-2 when they are in IP54 enclosures.

Ambient Temperature Derating for High Altitude



Fuses

Recommended input fuse ratings of the ACS/ACC 601 are below. **A** minimum rated current in amperes, **A²s** maximum clearing I^2t value, **V** rated voltage in volts. Only ultra rapid fuses guarantee proper protection for the rectifier semiconductors.

ACx 600 Type Code	Fuses						
	A	Clearing A^2s	V	Manufacturer	Type DIN 43653	Size	Comments
ACx 601-0003-2 ACx 601-0005-2	16	48	660	Bussmann	170M1359	000/80	
ACx 601-0006-4	16	48	660	Bussmann	170M1359	000/80	601 + Extended Encl.
ACx 601-0009-4	16	48	660	Bussmann	170M1359	000/80	601 + Extended Encl.
ACx 601-0006-2	25	130	660	Bussmann	170M1361	000/80	
ACx 601-0011-4	25	130	660	Bussmann	170M1361	000/80	601 + Extended Encl.
ACx 601-0009-2	32	270	660	Bussmann	170M1362	000/80	
ACx 601-0016-4	32	270	660	Bussmann	170M1362	000/80	601 + Extended Encl.
ACx 601-0011-2	40	460	660	Bussmann	170M1363	000/80	
ACx 601-0020-4	40	460	660	Bussmann	170M1363	000/80	601 + Extended Encl.
ACx 601-0016-2	50	770	660	Bussmann	170M1364	000/80	
ACx 601-0025-4	50	770	660	Bussmann	170M1364	000/80	601 + Extended Encl.
ACx 601-0030-4	63	1450	660	Bussmann	170M1365	000/80	601 + Extended Encl.
ACx 601-0020-2	80	1250	660	Bussmann	170M3011	1/80	
ACx 601-0040-4	80	2550	660	Bussmann	170M1366	000/80	601 + Extended Encl.
ACx 601-0025-2	125	3700	660	Bussmann	170M3013	1/80	
ACx-601-0030-2							
ACx 601-0050-4	80	2550	660	Bussmann	170M1366	000/80	601 + Extended Encl.
ACx 601-0060-4	125TH	8500	660	Bussmann	170M1368	000/80	601 + Extended Encl.
ACx 601-0040-2	160	7500	660	Bussmann	170M3014	1/80	
ACx 601-0050-2	200	28000	660	Bussmann	170M1370	000/80	
ACx 601-0070-4	160	16000	660	Bussmann	170M1369	000/80	601 + Extended Encl.
ACx 601-0100-4	200	28000	660	Bussmann	170M1370	000/80	601 + Extended Encl.
ACx 601-0060-2 ACx 601-0070-2 ACx 601-0080-2 ACx 601-0100-2 ACx 601-0120-4 ACx 601-0140-4	400	105000	660	Bussmann	170M3019	1/80	
ACx 604-0120-2	700	405000	660	Bussmann	170M5163	2	
ACx 604-0140-2	700	405000	660	Bussmann	170M5013	2	
ACx 604-0170-2	800	465000	660	Bussmann	170M6012	3	
ACS607-0120-4	400	105000	660	Bussmann	170M3169		
ACS607-0140-4	400	105000	660	Bussmann	170M3169		
ACS607-0170-4	400	105000	660	Bussmann	170M3169		
ACS607-0210-4	550	190000	660	Bussmann	170M5161		
ACS607-0260-4	700	405000	660	Bussmann	170M5163		
ACS607-0320-4	700	405000	660	Bussmann	170M5013		
ACS607-0400-4	800	465000	660	Bussmann	170M6012		
ACS607-0490-5	700	405000	660	Bussmann	170M5813*		*Type DIN 43620
ACS607-0610-5	700	405000	660	Bussmann	170M5813*		*Type DIN 43620
ACS607-0760-5	800	465000	660	Bussmann	170M6812*		*Type DIN 43620

Note: Only ultra rapid fuses guarantee the proper protection for the rectifier semiconductors. Any UL recognized (JFHR2) fuse can be used if it meets the ratings in the table.

Cable Entries

Power and motor cable terminal sizes and tightening torques for the ACS/ACC 601 with cable diameters accepted by the rubber glands are given below. All power wiring must be rated for 60 °C minimum.

ACx 601 Type Code	**U1,V1,W1 / U2,V2,W2**			**Ground (PE)**	
	Maximum WIre Size	**Cable Ø** mm 2)	**Tightening Torque**	**Maximum WIre Size**	**Cable Ø** mm
ACx 601-0003-2	6 mm^2 #10 AWG	14...20	1.5...1.8 Nm 13-18 lb.-in.	6mm^2 #10 AWG	10...14
ACx 601-0005-2		14...20			10...14
ACx 601-0006-2		14...20			10...14
ACx 601-0009-2 ACx 601-0006-4 ACx 601-0009-4 ACx 601-0011-4		14...20			10...14
ACx 601-0011-2	10 mm^2 #8 AWG	14...20		10mm^2 #8 AWG	10...14
ACx 601-0016-2 ACx 601-0016-4 ACx 601-0020-4		14...20			10...14
ACx 601-0020-2	16mm^2 #6 AWG	14...20		16mm^2 #6 AWG	10...14
ACx 601-0025-2 ACx 601-0025-4 ACx 601-0030-4		14...20			10...14
ACx 601-0040-4 ACx 601-0050-4 ACx 601-0060-4	Cu. 35 mm^2 #2 AWG	20...26	8 Nm 5.9 lb.-ft.	35mm^2 #2 AWG	10...14
ACx 601-0030-2	54 mm^2 #0 AWG	20...26	8 Nm 5.9 lb.-ft.	35mm^2 #2 AWG	10...14
ACx 601-0040-2		20...26			10...14
ACx 601-0050-2		20...26			10...14
ACx 601-0070-4 ACx 601-0100-4	70 mm^2 #00 AWG	26...35	8 Nm 5.9 lb.-ft.		
ACx 601-0060-2	95 mm^2 #000 AWG	26...35	12 Nm 8.9 lb.-ft.		10...14
ACx 601-0070-2		26...35			10...14
ACx 601-0080-2	1)		30 Nm 22 lb.-ft.	70mm^2 #00 AWG	
ACx 601-0100-2					

1) The terminals are 10mm (13/32”) bolts for attaching ring lugs (lugs not furnished).

2) IEC version. Range of cable diameters accepted by gland plate holes. For USA version conduit plate drawings, see pages B-9 and B-10.

ACx 604/607 Type Codes	AC Line Terminals			Motor Terminals			Grounding Terminals		Cabinet (Frame)
	U1,V1,W1		T	U2,V2,W2		T	Grounding PE	T	
	Cu	Al	Lbs/ Nm	Cu	Al	Lbs/ Nm		Lbs/ Nm	
ACx 604-0120-4 ACx 604-0140-4	1x(10-120) 3) #0000	1)	22/30	1x(10-120) #0000	1)	22/30	41 mm^2 2)	22/30	- (R7)
ACx 604-0120-2 ACx 604-0170-4 ACx 604-0210-4 ACx 604-0260-4	1x(10-240) 3) 400MCM	1x(10-240) 3) 400MCM	22/30	3x(12-240) 3x400MCM	3x(12-240) 3x400MCM	33/44	M10 (2 pcs) 3)	22/30	- (R8)
ACx 604-0140-2 ACx 604-0170-2 ACx 604-0320-4 ACx 604-0400-4	1x(10-240) 3) 400MCM	1x(10-240) 1) 400MCM	22/30	3x(12-240) 3x400MCM	3x(12-240) 3x400MCM	33/44	M10 (2 pcs) 2)	22/30	- (R9)
ACx 607-0120-4	1x120 #0000	1x120 #0000	22/30	1x(12-120) #0000	1x(12/120) #0000	22/30	M12	22/30	MNS (R7)
ACx 607-0140-4	1x185 350MCM	2x(12/240) 2x400MCM	22/30	1x(12-185) 350MCM	1x(12-185) 350MCM	22/30	M12	22/30	MNS (R7)
ACS 607-0170-4 ACx 607-0210-4 ACx 607-0260-4	2x(12-185) 2x350MCM	2x(12/240) 2x400MCM	33/44	2x(12/185) 2x350MCM	2x(12/240) 2x400MCM	33/44	M12	22/30	MNS (R8)
ACx 607-0320-4 ACx 607-0400-4	2x(12-185) 2x350MCM	2x(12/240) 2x400MCM	33/44	2x(12-185) 2x350MCM	2x(12-240) 2x400MCM	33/44	M12	22/30	MNS (R9)
ACx 607-0490-5	4x(12-185) 4x350MCM	4x(12-240) 4x400MCM	41/55	4x(12-185) 4x350MCM	4x(12-240) 4x400MCM	41/55	M10 (2x2 pcs)	26/35	MNS (2xR8)
ACx 607-0610-5 ACx 607-0760-5	4x(12-185) 4x350MCM	4x(12-240) 4x400MCM	41/55	4x(12-185) 4x350MCM	4x(12-240) 4x400MCM	41/55	M10 (2x2 pcs)	26/35	MNS (2xR9)

1) The maximum acceptable size of the cable is 3x120+70 (3x(AWG 000) + AWG 00); cross sectional areas of copper conductors in mm^2, 3 x phase conductor + PE conductor). Aluminum cable cannot be connected due to cable lug size.

2) This is the grounding terminal for the PE bus and the frame of the ACx 604 module. The terminal is to be connected to the PE bus of the cabinet the module is installed in. M10 metric bolt (3/8 in. dia.).

3) Isolated Stud terminal

External Control Connections (NIOC)

External control connections of ACx 600 with US standard application software (Factory Macro) are below. External control connections are different with other application macros and softwares (see *Firmware Manual*).

Terminal Block Size
X21, X22, X23, X25, X26, X27: cables 0.5 to 1.5 mm^2 (#20 to #16 AWG)
X2: cables 0.5 to 2.5 mm^2 (#20 to #14 AWG)
Control Cable Lead-through Size:
Ø: 2 x 3x2...11 mm (IEC units)

Factory settings of application software selection B (type code):
DI1: Start, DI2: Stop, DI3: Reverse, DI4: Acc/Dec 2, DI5,6: Constant speed 1 to 3 select.

1) Parameter 10.3 must be set to REQUEST.

2) Operation: 0 = Open, 1 = Closed

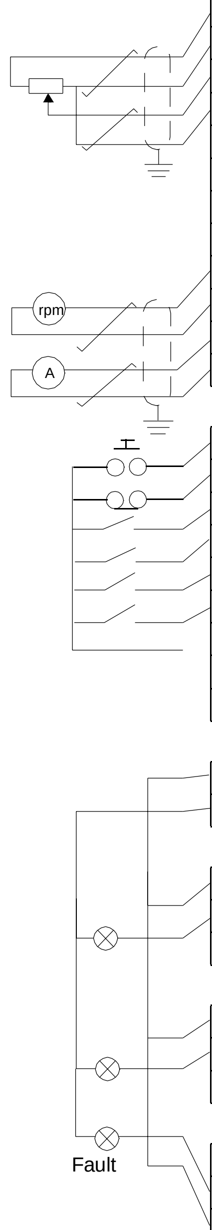
DI 5	DI 6	Output
0	0	Set speed through AI1
1	0	Constant Speed 1
0	1	Constant Speed 2
1	1	Constant Speed 3

Connector X28 for RS 485 connection

1	TRANS	Link Connections
2	GND	
3	B-	
4	A+	
5	GND	Power to link
6	+24 V	

Connector X29 for RS 485 connection

1	TRANS	Link Connections
2	FAULT	
3	B-	
4	A+	
5	GND	Power to link
6	+24 V	



ACS 601/604/607 NIOC Board (A2) — **Programmable I/O Factory Settings**

X21

1	VREF	Reference voltage 10 V d.c. 1 kΩ ≤ R_L ≤ 10 kΩ
2	GND	
3	AI1+	Speed reference 0(2) ... 10 V R_{in} > 200 kΩ
4	AI1-	
5	AI2+	By default, not in use. 0(4)... 20 mA, R_{in} = 100 Ω
6	AI2-	
7	AI3+	By default, not in use. 0(4)... 20 mA, R_{in} = 100 Ω
8	AI3-	
9	AO1+	Motor speed 0(4)...20 mA ≙ 0...motor nom. speed, R_L ≤ 700 Ω
10	AO1-	
11	AO2+	Output current 0(4)...20 mA ≙ 0...motor nom. current, R_L ≤ 700 Ω
12	AO2-	

X22

1	DI1	Start
2	DI2	Stop
3	DI3	Forward / Reverse 1)
4	DI4	ACCEL/DECEL 1/2
5	DI5	Constant speed select 2)
6	-	Constant speed select 2)
7	+24V	+24 V d.c. max. 100 mA
8	+24V	
9	DGND	Digital Ground

X23

1	+24 V	Auxiliary voltage output, non-isolated, 24 V d.c. 250 mA
2	GND	

X25

1	RO11	Relay output 1 Ready
2	RO12	
3	RO13	

X26

1	RO21	Relay output 2 Running
2	RO22	
3	RO23	

X27

1	R031	Relay output 3 Fault (-1)
2	R032	
3	R033	

Heat DIssipation Requirements

ACx 601/4/7 drives are self-cooled. The table below gives the heat dissipated into the hot air exhausted from the drives. If the drives are installed in a confined space, the heat must be removed from the area by ventilation or air conditioning equipment.

ACx 600 Type Code	Heat Dissipation	
	Watts	BTU/Hr
ACx 601-0003-2	112	380
ACx 601-0005-2	156	530
ACx 601-0006-2	182	620
ACx 601-0009-2	217	740
ACx 601-0011-2	370	1265
ACx 601-0016-2	540	1840
ACx 601-0020-2	620	2120
ACx 601-0025-2	1000	3400
ACx 601-0030-2	1120	3800
ACx 601-0040-2	1480	5100
ACx 601-0050-2	1880	6400
ACx 601-0060-2	2185	7500
ACx 601-0070-2	2950	10100
ACx 601-0080-2	3200	10900
ACx 601-0100-2	4300	14700
ACx 604/7-0120-2	6300	21500
ACx 604/7-0140-2	7800	26600
ACx 604/7-0170-2	9600	32800
ACx 601-0006-4	100	341
ACx 601-0009-4	130	444
ACx 601-0011-4	170	581
ACx 601-0016-4	240	820
ACx 601-0020-4	320	1093
ACx 601-0025-4	460	1571
ACx 601-0030-4	620	2117
ACx 601-0040-4	760	2596
ACx 601-0050-4	920	3142
ACx 601-0060-4	1130	3859
ACx 601-0070-4	1530	5225
ACx 601-0100-4	1840	6284
ACx 601-0120-4	2250	7684
ACx 601-0140-4	2700	9221
ACx 604/7-0120-4	2300	7848
ACx 604/7-0140-4	2800	9551
ACx 604/7-0170-4	3300	11260
ACx 604/7-0210-4	4000	13650
ACx 604/7-0260-4	5000	17061
ACx 604/7-0320-4	6300	21500
ACx 604/7-0400-4	7900	26956
ACx 604/7-0490-5	10000	34121
ACx 604/7-0610-5	12500	42652
ACx 604/7-0760-5	12500	53912

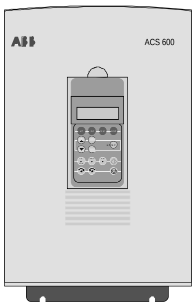
Cooling Air Flow Requirements

Cooling air flow requirements are given below**.**

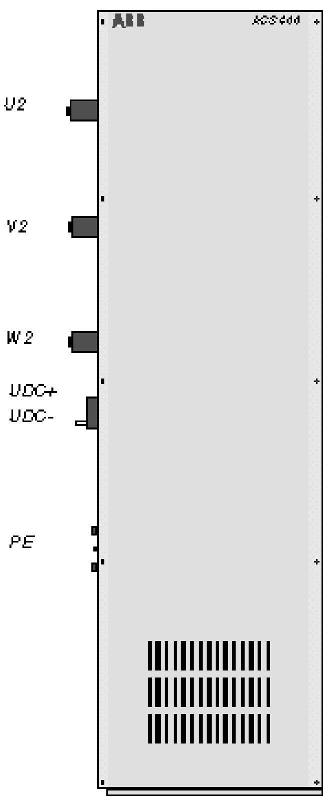
ACx 600 Type Code	Flow m^3/h	Flow ft^3/min
ACx 601-0003-2 ACx 601-0005-2 ACx 601-0006-4 ACx 601-0009-4 ACx 601-0011-4	40	24
ACx 601-0006-2	50	30
ACx 601-0009-2 ACx 601-0016-4 ACx 601-0020-4	60	35
ACx 601-0025-4	70	41
ACx 601-0030-4	100	60
ACx 601-0011-2 ACx 601-0016-2	150	90
ACx 601-0020-2 ACx 601-0040-4 ACx 601-0050-4 ACx 601-0060-4	260	155
ACx 601-0025-2 ACx 601-0070-4 ACx 601-0100-4	280	165
ACx 601-0030-2 ACx 601-0040-2	300	175
ACx 601-0050-2	350	210
ACx 601-0060-2	500	295
ACx 601-0070-2	550	325
ACx 601-0080-2 ACx 60x-0120-4 ACx 60x-0140-4	660	390
ACx 601-0100-2	700	410
ACx 604/7-0120-2 ACx 604/7-0170-4 ACx 604/7-0210-4 ACx 604/7-0260-4	1640	965
ACx 604/7-0140-2 ACx 604/7-0170-2 ACx 604/7-0320-4 ACx 604/7-0400-4	1840	1085
ACx 604/7-0490-5	3580	2107
ACS604/7-0610-5 ACx604/7-0760-5	3980	2343

Dimensions and Weights

ACx 601



ACx 604



ACx 600 Type Code	Height mm/in	Width mm/in	Depth mm/in	Weight kg/lb
ACx 601-0003-2 ACx 601-0005-2 ACx 601-0006-2 ACx 601-0009-2 ACx 601-0006-4 ACx 601-0009-4 ACx 601-0011-4	420/16.5	220/8.7	292/11.5	14/31
ACx 601-0011-2 ACx 601-0016-2 ACx 601-0016-4 ACx 601-0020-4	420/16.5	260/10.2	298/11/7	17.5/39
ACx 601-0020-2 ACx 601-0025-2 ACx 601-0025-4 ACx 601-0030-4	526/20.7	306/12.0	310/12.2	25/55
ACx 601-0030-2 ACx 601-0040-2 ACx 601-0050-2 ACx 601-0040-4 ACx 601-0050-4 ACx 601-0060-4	715/27.8	306/12.0	360/14.2	35/77
ACx 601-0060-2 ACx 601-0070-2 ACx 601-0070-4 ACx 601-0100-4	715/27.8	306/12.0	432/17.0	50/110
ACx 601-0080-2 ACx 601-0100-2 ACx 60x-0120-4 ACx 60x-0140-4	860/33.9	480/18.9	428/16.9	88/194
ACx 604-0120-2 ACx604-0170-4 ACx 604-0210-4	1250 (49.2)	462*/524 (18.19/20.63)	407 (16)	135 (297)
ACx 604-0140-2 ACx 604-0170-2 ACx 604-0320-4 ACx 604-0400-4	1600 (63)	462*/524 (18.19/20.63)	407 (16)	166 (365)

ACx 604-0490-5 = 2 x Dimensions of ACx 604-0260-4
ACx 604-0610-5 = 2 x Dimensions of ACx 604-0320-4
ACx 604-0760-5 = 2 x Dimensions of ACx 604-0400-4

Input Power Connection

Voltage (U_1):
208/230/240 VAC 3-phase ± 10%

380/400/514/440/460/480/500 VAC 3-phase ± 10%

Short Circuit Capability: The rated short time withstand current of ACx 600 is 50 kA 1s.

Frequency: 48 to 63 Hz, maximum rate of change 17%/s

Imbalance: Max. ± 3% of nominal phase to phase input voltage

Fundamental Power Factor (cos φ_1): 0.97 (at nominal load)

Motor Connection

Voltage (U_2): 0 to U_1, 3-phase symmetrical

Frequency: DTC mode: 0 to 3.2 · f_{FWP}. Maximum frequency 300 Hz.

$$f_{FWP} = \frac{U_{Nmains}}{U_{Nmotor}} \cdot f_{Nmotor}$$

f_{FWP}: Frequency at field weakening point; U_{Nmains}: Mains voltage;
U_{Nmotor}: Rated motor voltage; f_{Nmotor}: Rated motor frequency

Scalar Control mode: 0 to 300 Hz
With dv/dt Filter (DTC and Scalar Control modes): 0 to 120 Hz

Frequency Resolution: 0.01 Hz

Continuous Current: 1.0 · I_{2N} (normal use)
1.0 · I_{2hd} (heavy-duty use)

Short Term Overload Capacity (1 min/10 min): $I_{2Nmax} = 1.1 \cdot I_{2N}$
$I_{2hdmax} = 1.5 \cdot I_{2hd}$

Peak Overload Capacity (2 s/15 s):
1.5 · I_{2N}
2.0 · I_{2hd}

Power Limit: 1.5 · P_{hd}

Overcurrent Trip: 3.5 · I_{2hd}

Field Weakening Point: 8 to 300 Hz

Switching Frequency: 3 kHz (average).

Maximum Recommended Motor Cable Length: 300 m (980 ft.). This is the cumulative length in case of parallel connected motors. For ACx 601-0003-2 to ACx 601-0016-2, if the motor cable length exceeds 70 meters (230 ft.), an ABB representative should be consulted.

Bearings of motors larger than 90 kW (125 Hp): Insulated bearing at non-driven end is recommended.

Efficiency and Cooling

Efficiency: Approximately 98% at nominal power level

Cooling Method: Internal fan, flow direction from the bottom to the top

External Control Connections

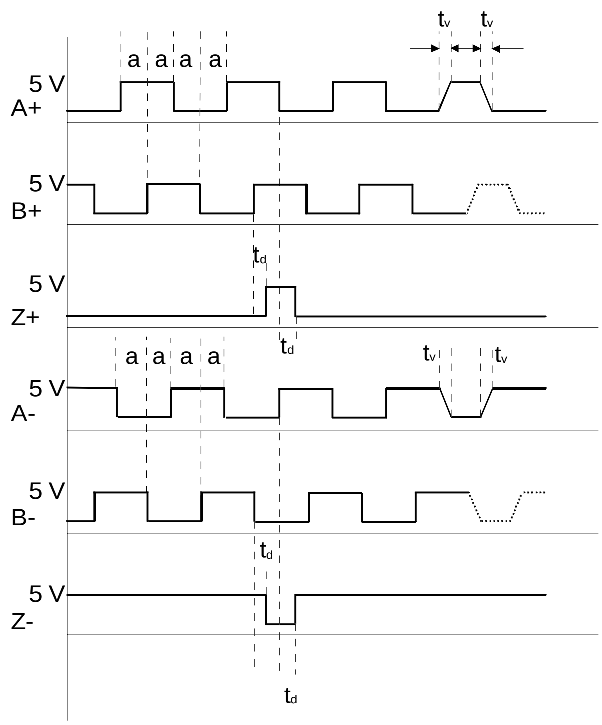
Data of the external control connection boards of the ACx 600 product family are given below.

	ACS/ACC 600 NIOC-01 Board
Analog Inputs The advantage of the differential analog input is that the ground potential of the device or transmitter sending an analog signal can differ up to ± 15 V from the ground potential of the ACx 600 chassis without disturbing the signal. Differential input also efficiently attenuates common mode disturbances coupled to control cables.	**ACS 600: Two Programmable Differential Current Inputs:** 0 (4) to 20 mA, R_{in} = 100 Ω **ACC 600: Two Differential Current Inputs:** 0 to 20 mA, R_{in} = 100 Ω **ACS 600: One Programmable Differential Voltage Input:** ACS 600: 0 (2) to 10 V, R_{in} > 200 kΩ **ACC 600: One Differential Voltage Input:** 0 to 10 V, R_{in} > 200 kΩ **Common Mode Voltage: ± 15 VDC, max.** **Common Mode Rejection Ratio:** ≥ 60 dB at 50 Hz **Resolution:** 0.1 % (10 bit) **Inaccuracy:** ± 0.5% (Full Scale Range) at 25 °C (77 °F). Temperature Coefficient: ± 100 ppm/°C (56 ppm/ °F), max. **Input Updating Time:** 12 ms (ACS 600), 44 ms (ACC 600)
Constant Voltage Output	**Voltage:** 10 VDC ± 0.5% (Full Scale Range) at 25 °C (77 °F). Temperature Coefficient: ± 100 ppm/°C (56 ppm/ °F), max. **Maximum Load:** 10 mA **Applicable Potentiometer:** 1 kΩ to 10 kΩ
Auxiliary Power Output	**Voltage:** 24 VDC ± 10%, Short circuit proof **Maximum Current:** 250 mA (130 mA with NLMD-01 option)
Analog Outputs	**ACS/ACC 600: Two Programmable Current Outputs:** 0 (4) to 20 mA, R_L ≤ 700 Ω **Resolution:** 0.1 % (10 bit) **Inaccuracy:** ± 1% (Full Scale Range) at 25 °C. Temperature Coefficient: ± 200 ppm/°C (110 ppm/ °F), max. **Output Updating Time:** 24 or 100 ms (ACS 600), 44 ms (ACC 600)

	ACS/ACC 600 **NIOC-01 Board**
Digital Inputs	**ACS 600: Six Programmable Digital Inputs (Common Ground):** 24 VDC, -15% to +20% **ACC 600: Six Digital Inputs (Common Ground):** 24 VDC, -15% to +20% **Logical Thresholds:** < 8 VDC $\widehat{=}$ “0”, > 12 VDC $\widehat{=}$ “1” **Input Current:** DI1 to DI 5: 10 mA, DI6: 5 mA **Filtering Time Constant:** 1 ms **Thermistor Input:** 5 mA, < 1.5 kΩ $\widehat{=}$ “1” (normal temperature), > 4 kΩ $\widehat{=}$ “0” (high temperature), Open Circuit $\widehat{=}$ “0” (high temperature) **Internal Supply For Digital Inputs (+24 VDC):** Short circuit proof, group isolated **Isolation Test Voltage:** 500 VAC, 1 minute **Input Updating Time:** 12 ms (ACS 600), 44 ms (ACC 600) **An external 24 VDC supply can be used instead of the internal supply.**
Digital Outputs	
Relay Outputs	**Three Programmable Relay Outputs** **Switching Capacity:** 8 A at 24 VDC or 250 VAC, 0.4 A at 120 VDC **Maximum Continuous Current:** 2 A rms **Contact Material:** Silver Cadmium Oxide (AgCdO) **Isolation Test Voltage:** 4 kVAC, 1 minute **Output Updating Time:** 100 ms (ACS 600), 44 ms (ACC 600)
DDCS Fiber Optic Link	**Protocol:** DDCS (ABB Distributed Drives Communication System)
Encoder Input	

Encoder Signals

Characteristic of incremental encoder signals in applications using the incremental encoder (for clockwise rotation, viewed from the drive end) is presented below.



Application Program

Various application programs are available for the ACx 600 AC drives. In the tables of this section, the ACx 600 product family program selections are referred to with the following abbreviations. Not all selections are available for all types. One application program at a time can be loaded in the memory of the drive.

ACx 600 Application Program	Abbreviation
Standard	ACS
CraneDrive	ACC
System	MultiDrive

Application Macros

The macros of the ACS/ACC application programs are below.

ACS	ACC
FACTORY for basic industrial applications	CRANE for normal crane drive
HAND/AUTO for local and remote operation	M/F CTRL for two crane drive applications with Master/Follower operation
PID CONTROL for closed loop processes	USER MACRO 1 & 2 for user’s own customized parameter settings
TORQUE CONTROL for processes that require torque control	
SEQUENTIAL CONTROL for operation at preset constant speeds	
USER MACRO 1 & 2 for user’s own customized parameter settings	

Protection Features

Application program dependent features of the ACx 600 are listed below. ● available as standard, ○ optional

Preprogrammed Faults	ACS	ACC	Multi Drive
ACx 600 temperature	●	●	●
Overcurrent	●	●	●
Short circuit	●	●	●
DC overvoltage	●	●	●
Supply phase	●	●	●
DC under voltage	●	●	●
Over frequency	●	●	●
Overspeed			
Internal fault	●	●	●
Internal fault on the I/O control board	●	●	●
Ambient temperature	●	●	●
User Macro	●	●	
Braking chopper (in fieldbus mode)		●	
Inverter overload		●	
No motor data	●		
ID Run fail	●		

Programmable Fault Functions	ACS	ACC	Multi Drive
Analog input below minimum value	●		
Loss of Control Panel	●	●	●
External fault	●	●	●
Motor over temperature	●	●	●
Thermistor/Pt 100	●	●	●
Motor stalled	●		●
Motor underload	●		●
Loss of motor phase	●	●	●
Ground fault	●	●	●
Speed measurement			
Motor overspeed		●	
Torque		●	
Torque proving		●	
Brake		●	
Communication test		●	
Following error			
Position limits			
Maximum speed alteration			
Speed difference			
Communication error	○	○	○
Encoder interface module	○	○	○

Program. Supervision Functions	ACS	ACC	Multi Drive
Speed	2		2
Motor current	●		●
Motor torque	2		2
Motor speed	●		●
Reference 1	●		
Reference 2	●		
Actual value 1	●		
Speed threshold			
Torque threshold			
Position error			
Position threshold			
Joystick		●	
Brake long falling time		●	

Preprogrammed Warnings: ACS 600 temperature**,** Motor Identification Run, Drive Identification Number change, User Macro,

Programmable Automatic Reset Functions (ACS 600 only): after overcurrent, overvoltage, undervoltage and analog input below minimum value

Information Functions: ACx 600 control software version, ACx 600 application software version, ACx 600 test date.

Equipment Warranty and Liability

General: ABB warrants the Equipment supplied by ABB against defects in material and workmanship for a period of twelve (12) months after installation or twenty four (24) months from date of shipment from factory, whichever first occurs.

Should any failure to conform with the applicable warranties appear during the specified periods under normal and proper use and provided the Equipment has been properly stored, installed, operated and maintained, and if given prompt notice by Purchaser, ABB shall correct such nonconformity, at its option; by (1) repair or replacement of the nonconforming equipment or parts thereof. Repairs or replacements pursuant to warranty shall not renew or extend the applicable original equipment warranty period, provided however, that any such repairs or replacement of equipment or parts thereof shall be warranted for the time remaining of the original warranty period or 30 days, whichever is longer.

ABB shall not be responsible for providing working access to the defect, including disassembly and reassembly of equipment or for providing transportation to and from repair or factory facility, all of which shall be at Purchaser's risk and expense.

These warranties shall not apply to any Equipment or parts thereof which (1) have been improperly repaired or altered; (2) have been subjected to misuse, negligence or accident; (3) have been used in a manner contrary to ABB's instructions; (4) are comprised of materials provided or designed stipulated by Purchaser; or (5) are used equipment.

The foregoing warranties are exclusive and in lieu of all other warranties of quality and performance, written, oral or implied, and all other warranties including any implied warranties of merchantability or fitness for a particular purpose are hereby disclaimed by ABB and all equipment manufacturers.

Correction of nonconformities in the manner and for the period of time provided above shall be the Purchaser's exclusive remedy and shall constitute fulfilment of all liabilities of ABB and any Equipment manufacturer (including any liability for direct, indirect, special, incidental or consequential damages) whether in warranty, contract, negligence, tort, strict liability, or otherwise with respect to any nonconformance of or defect or deficiency in the equipment supplied or services furnished hereunder.

Limitation of Liability

IN NO EVENT SHALL ABB, ITS SUPPLIERS OR SUBCONTRACTORS BE LIABLE FOR SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES, WHETHER IN CONTRACT, WARRANTY, TORT, NEGLIGENCE, STRICT LIABILITY OR OTHERWISE, including, but not limited to loss of profits or revenue, loss of use of the Equipment or any associated equipment, cost of capital, cost of substitute equipment, facilities or services, downtime costs, delays, or claims of customers of the Purchaser or other third parties for such or other damages. ABB's liability on any claim whether in contract, warranty, negligence, tort, strict liability, or otherwise for any loss or damage arising out of, connected with, or resulting from the contract or the performance or breach thereof, or from the design, manufacture, sale, delivery, resale, repair, replacement, installation, technical direction of installation, inspection, operation or use of any equipment covered by or in connection therewith, shall in no case exceed the purchase price of the Equipment or part thereof or services which give rise to the Claim.

All clauses of action against ABB arising out of or relating to the contract or the performance or breach hereof shall expire unless brought within one year of the time of accrual thereof.

In no event, regardless of cause, shall ABB assume responsibility for or be liable for penalties or penalty clauses of any description or for indemnification of customer or others for costs, damages, or expenses each arising out of or related to the goods or services of the order.

Your local distributor or ABB office may hold different guarantee details, which are specified in the sales terms, conditions, or guarantee terms. These terms are available on request.

If you have any questions concerning your ABB drive, please contact the local distributor or ABB office. The technical data, information and specifications are valid at the time of printing. The manufacturer reserves the right to modifications without prior notice.

Appendix B – ACS/ACC 600 US Only Drawings

Figure B-1 Conduit Plate Dimensional Drawing — ACS 600 Frame R7

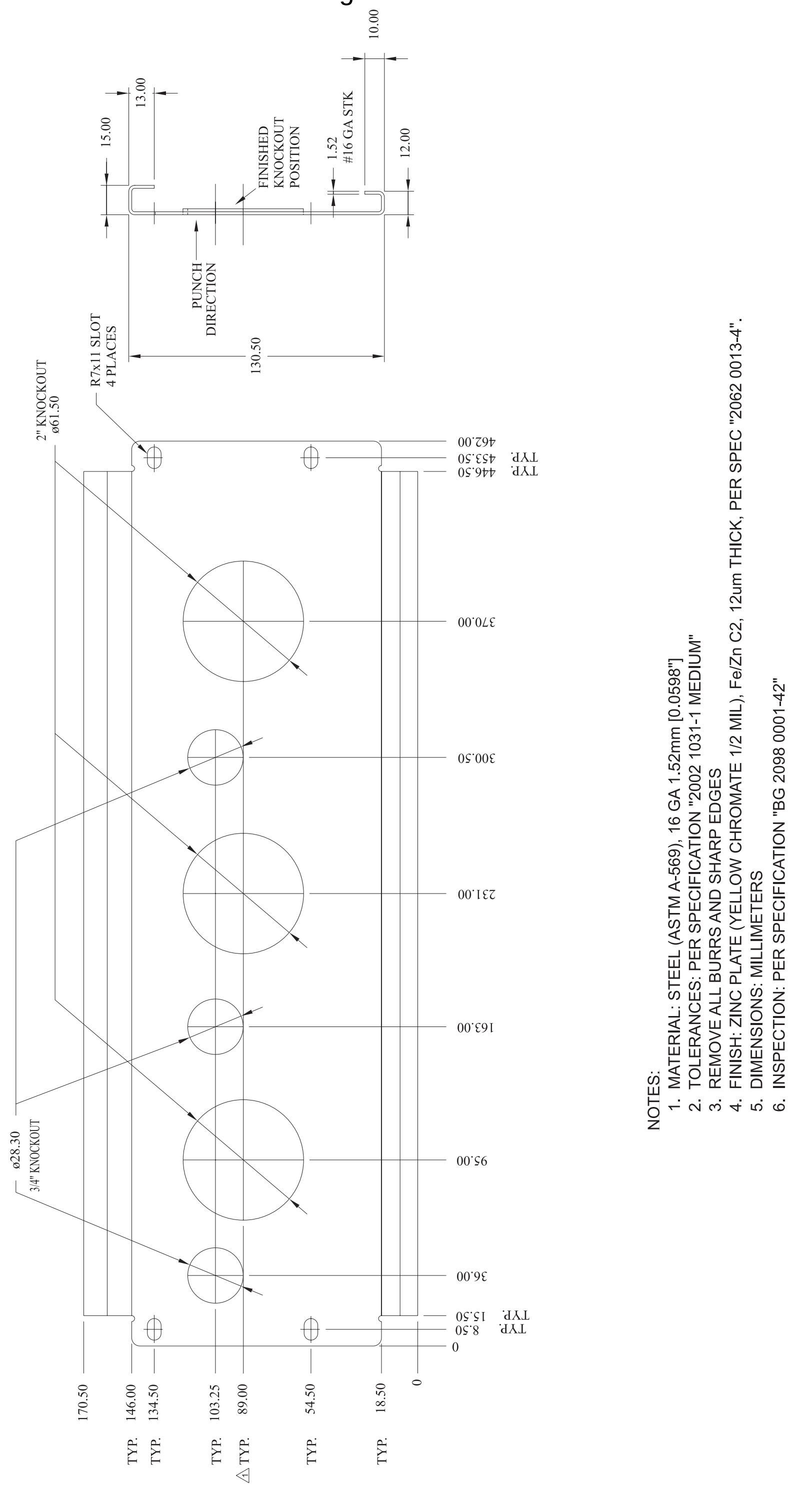


Figure B-2 Conduit Plate Dimensional Drawing — ACS 600 Frame R2

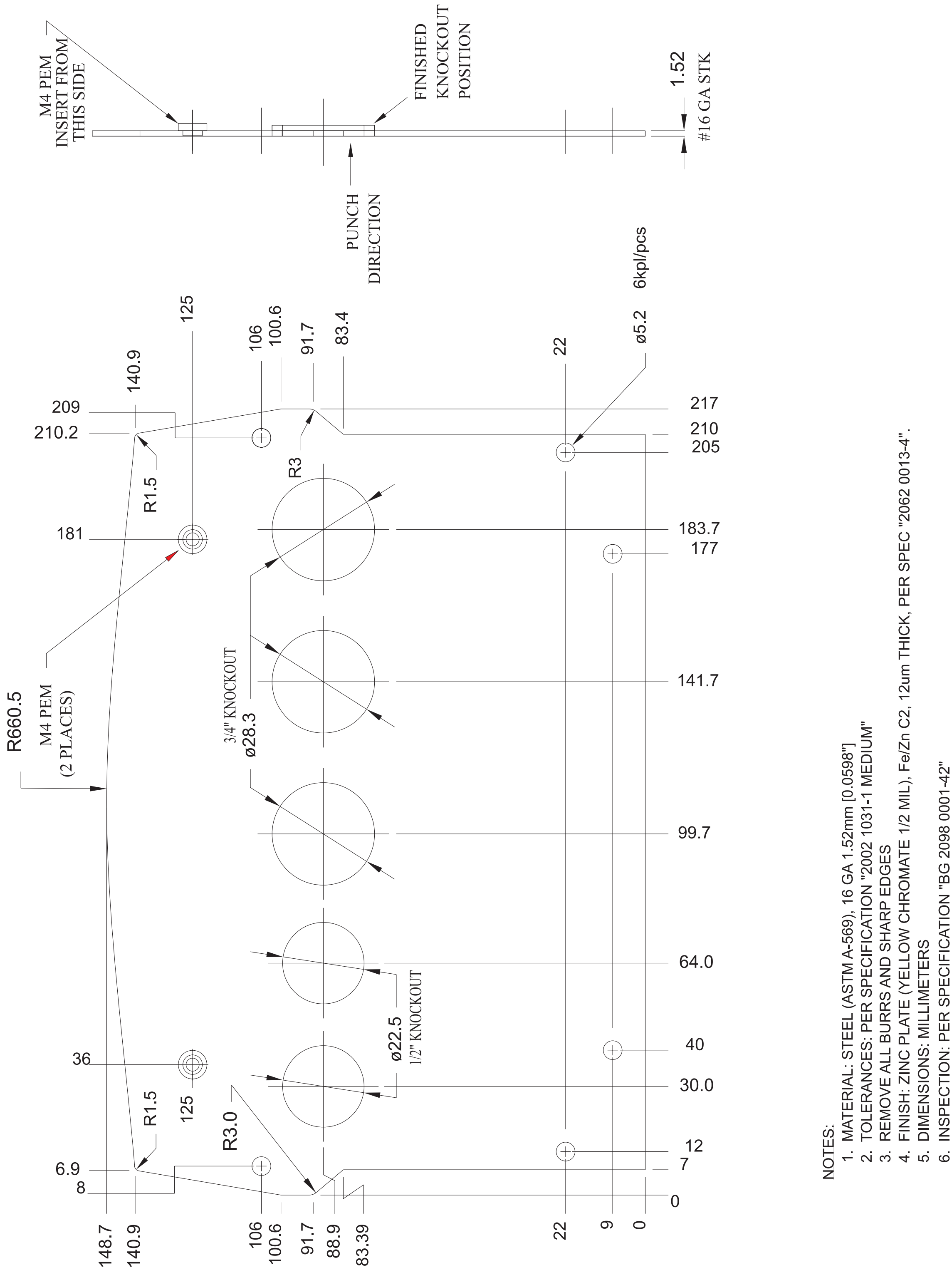


Figure B-3 Conduit Plate Dimensional Drawing — ACS 600 Frame R3

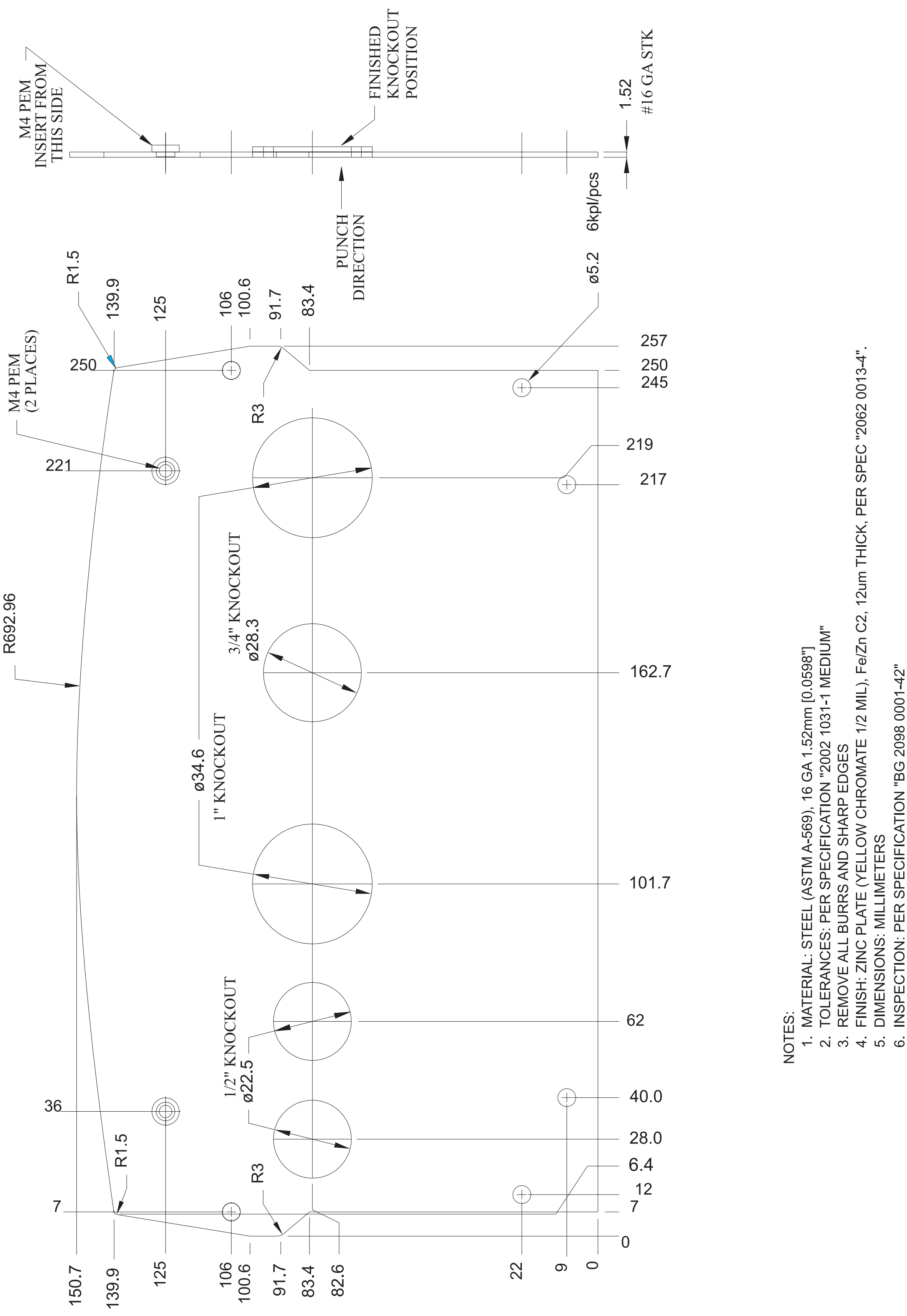


Figure B-4 Conduit Plate Dimensional Drawing — ACS 600 Frame R4

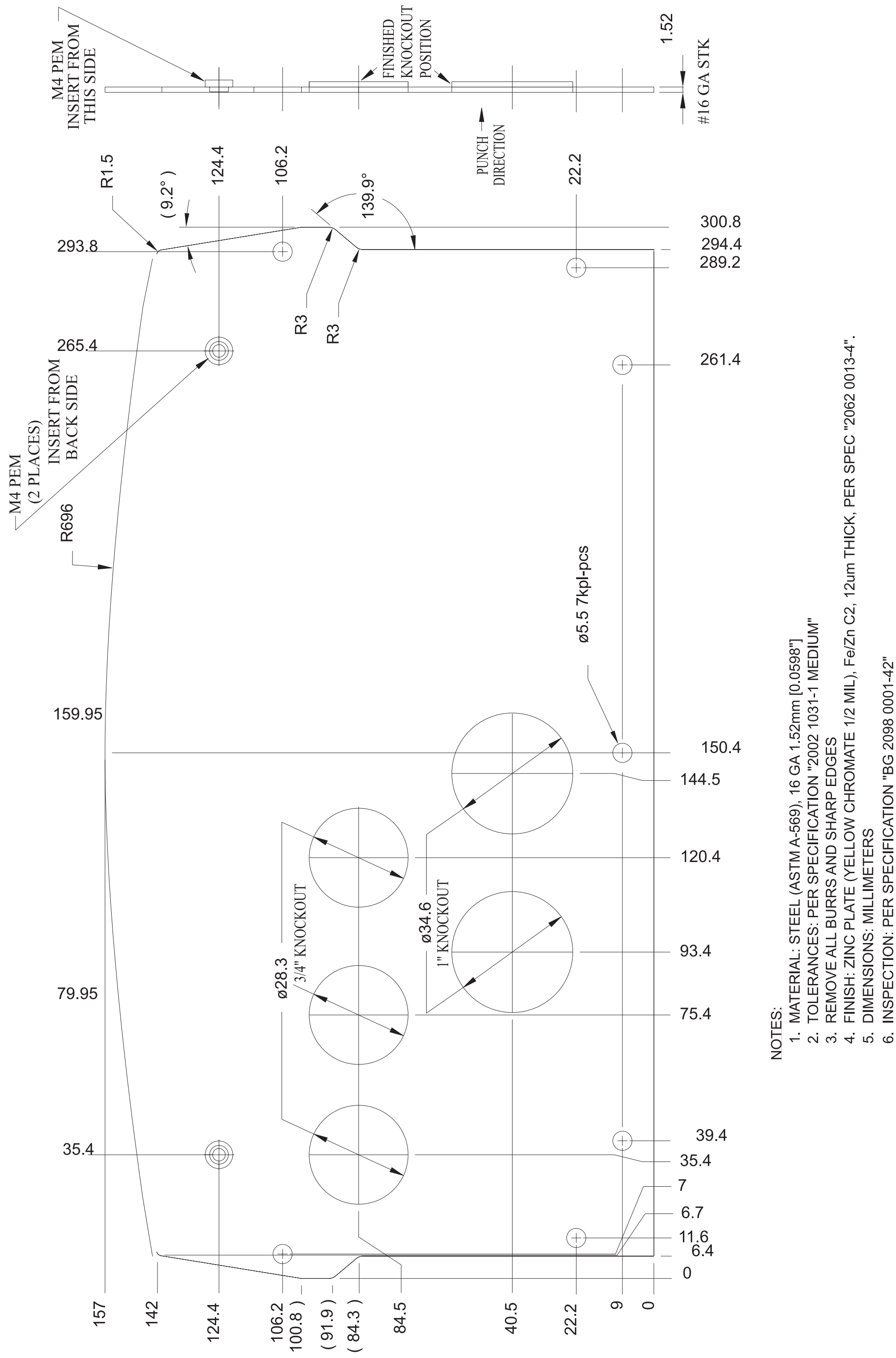
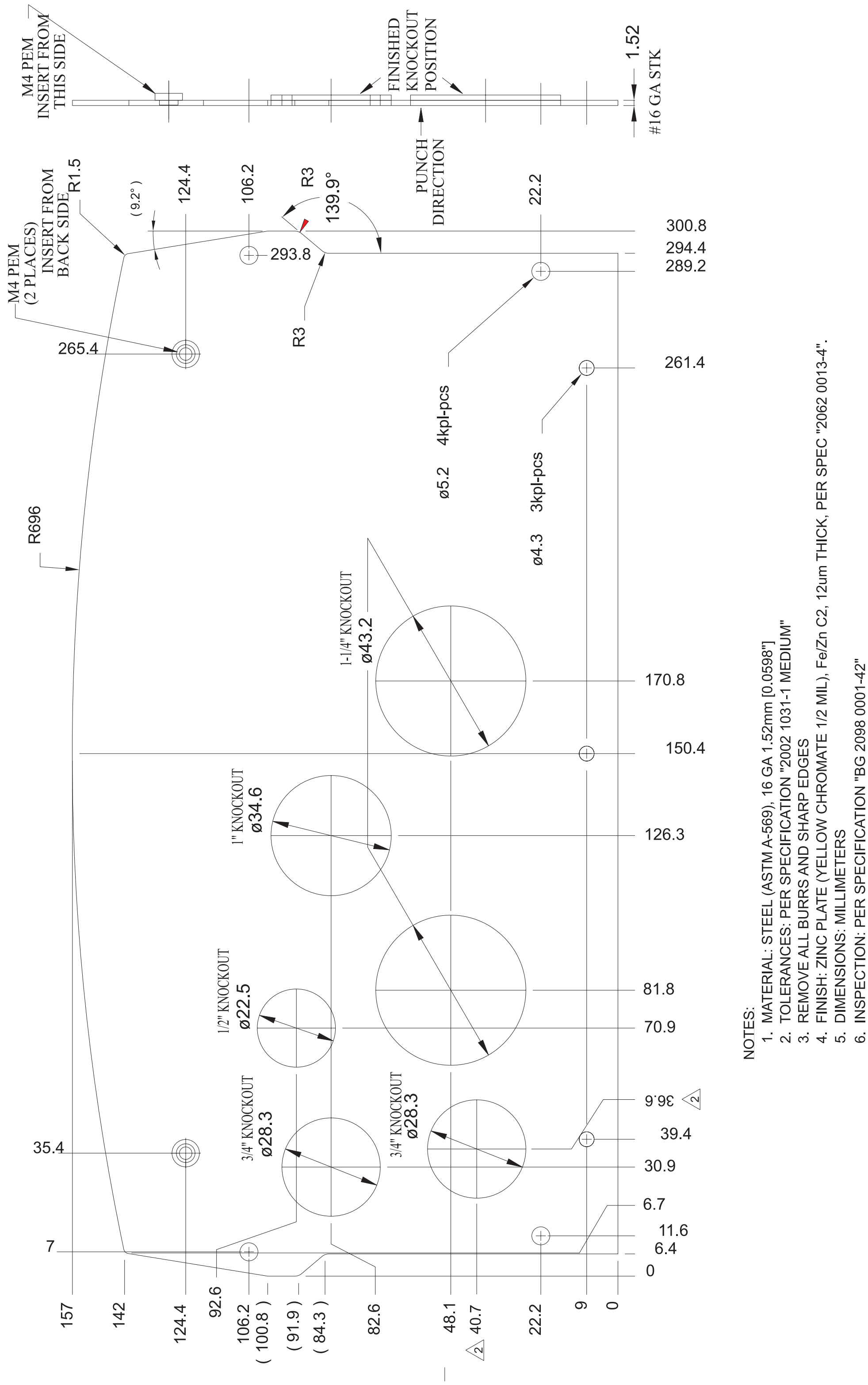


Figure B-5 Conduit Plate Dimensional Drawing — ACS 600 Frame R5/R6



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